HerdChek Salmonella antibody ELISA for the serological monitoring of Salmonella infection in swine

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Summary Idexx Laboratories Inc., in collaboration with the Dutch Animal Health Service developed a commercial ELISA test for the detection of antibodies against a broad range of Salmonella serotypes. The HerdChek Salmonella kit is an indirect ELISA based on a mixture of LPS antigens and can be used for testing of serum or meat juice samples. The performance of the test has been evaluated on well-characterized samples from experimental infection studies using several different Salmonella serotypes, as well as on sample populations of naturally infected herds. Testing of infected animals from different European countries and the United States was performed to ensure the detection of the most common serotypes in different geographical regions. A comparison to another commercially available ELISA was conducted to carefully investigate the surprisingly different detection levels of the tests.

Keywords diagnostics, Salmonella, serology, swine

Introduction Serological monitoring of Salmonella infection of swine by standardized commercial ELISA is a fast, simple and economical tool for the control of an infectious disease with considerable public health interest. Idexx Laboratories Inc., in collaboration with the Dutch Animal Health Services developed a commercial ELISA test for the detection of antibodies against a broad range of Salmonella serotypes in serum as well as in meat juice samples.

The performance of the test has been evaluated on well-characterized meat juice and serum samples from experimental infection studies, as well as sample populations of naturally infected herds. In the experimental studies several different Salmonella serotypes, representing different serogroups, were used for infection. Testing of infected animals from the Netherlands, Germany and the United States was performed to ensure the detection of the most common serotypes in different geographical regions.

Materials and Methods The HerdChek Salmonella kit is an indirect ELISA based on a mixture of LPS antigens. The assay format is harmonized with other Idexx HerdChek swine tests. All reagents are included in ready to use format and results can be obtained within 2 hours.

The evaluation of the test included two experimental infection studies using serum samples. One of these was a Dutch inoculation experiment with S. panama, S. typhimurium, S. livingstone and S. brandenburg. The evaluation also included an American study where pigs were infected with S. cholerasuis, S. infantis or S. typhimurium respectively. The experiments were compared to the results of another commercially available ELISA.

163 characterized meat juice samples from the US, provided by Prof. Blaha, were analyzed in the HerdChek Salmonella kit and compared to the results performed in Prof. Blaha's lab using a competitor's test kit. 30 German meat juice samples, provided by Dr. Czerny, were analyzed and compared to the results of another commercially available ELISA.

Results The HerdChek Salmonella kit, with a cut-off at 10 % (S/P 0.25), detects a clear serocoversion in the Dutch inoculation experiment already at the first sampling after infection (day 7) with S. typhimurium and S. livingstone (Fig. 1a). For S. panama and S. brandenburg a seroconversion is detected at the second sampling (day 14) (Fig. 1a). The same samples in the competitor's kit, with a cut-off at 40 %, only S. typhimurium and S. brandenburg are detected at day 14 (Fig. 1b).

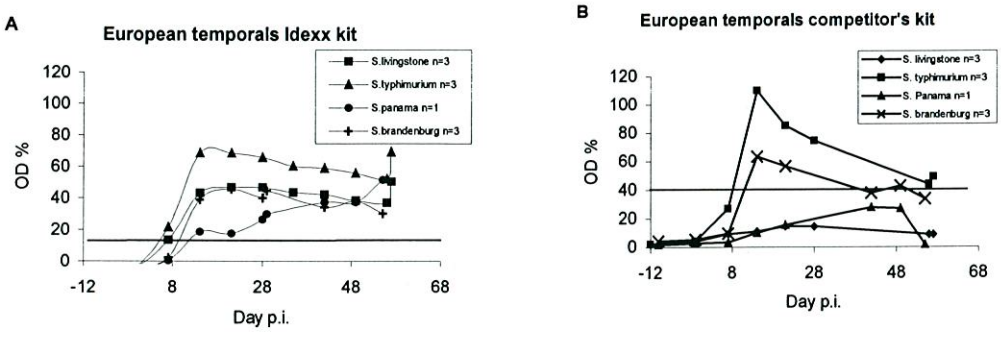

Figure 1. Dutch inoculation experiment with S. panama, S. typhimurium, S. livingstone and S. brandenburg. Black line marks the cut-off. A) Results with the HerdChek Salmonella kit, cut-off 10%. B) Results with a competitor's kit, cut-off 40%.

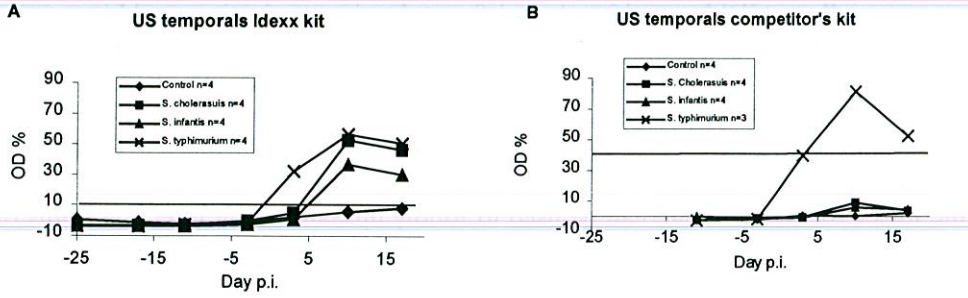

Figure 2. American study where pigs were infected with S. cholerasuis, S. infantis or S. typhimurium. The black line marks the cut-offs. A) Results with the HerdChek Salmonella kit, cut-off 10%. B) Results with a competitor's kit, cut-off 40%.

Fig. 2a and b display the results from the American study where pigs were infected with S. cholerasuis, S. infantis or S. typhimurium. The HerdChek Salmonella kit detects a serocoversion in the S. typhimurium experiment after 3 days, and in S. cholerasuis and S. infantis after 10 days. The competitors kit detects S. typhimurium after 3 days, but not S. cholerasuis or S. infantis.

Of the 163 characterized meat juice samples from the US 87 % correlate with the competitor's results (Table. 1). Also the results of the 30 meat juice samples from Germany correlate well (83%) between the two test kits (Table. 1).

Table 1. Meat juice samples with the Idexx HerdChek Salmonella kit (cut-off 10%) and in a competitor's kit (cut-off 40%). A) US samples, B) German samples.

	Idexx kit	**Competitor's kit**
A. US samples		
Positive	37	17
Negative	126	146
B. German samples		
Positive	17	12
Negative	13	18

Disussion In the comparison of the HerdChek Salmonella kit and the competitor's kit a clear difference in detection level was seen for serum samples, especially for certain serogroups. For meat juice samples on the other hand the correlation is better. Many countries are today starting up control programs for monitoring of Salmonella prevalence in slaughter pigs. To make the results of different control

programs comparable it would be very useful to harmonize the different commercially available test kits. A tool for such a harmonization could be certain sets of defined samples that all companies developing diagnostic kits had access to. Especially true negative populations are hard to find, but yet crucial for the development of a trustworthy diagnostic test.
Idexx Laboratories Inc. has developed a highly sensitive diagnostic ELISA for monitoring Salmonella infection in swineherds. Additional to the serological test the Idexx XChek software can be used to follow up Salmonella infection status of herds. The HerdChek Salmonella kit and the XChek software are two tools for the Salmonella control programs to make an effective monitoring.

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